WATER MANAGEMENT IN ALBERTA

CHALLENGES FOR THE FUTURE

BACKGROUND PAPER

VOLUME 6

WATER CONSERVATION

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SUMMARY

VOLUME 6: WATER CONSERVATION

Volume six contains two sections that deal with water conservation. The first section reviews the need for water conservation and the current practices in Alberta while the second part looks at the relationship between water pricing and conservation.

CHAPTER 1: WATER CONSERVATION

Water covers eighty percent of the earth's surface, yet only a small amount is available for human consumption. As we use more and more water and as pollution affects water quality, it becomes necessary to protect and conserve these water resources.

Historically, Alberta Environment has managed the province's water resources to serve the widest range of uses. This responsibility will continue and be complemented by encouraging users to conserve water.

The ***Water Resources Act*** does not include provisions for promoting or legislating water conservation. Nonetheless, Alberta has taken the initiative in some areas that encourage the protection and wise use of water resources. The Cold Lake-Beaver River Long Term Water Management Plan is an example.

Water conservation needs to be defined in an Alberta context when considering new water management policies and legislation. The criteria that can be included in a definition of water conservation include the following:

- practicing wise use
- using less water
- maintaining water quality
- protecting water supplies
- preserving water resources

A combination of water quality and demand management approaches may be considered for protection of water resources. This includes such aspects as financial adjustments, education, and regulations.

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The background paper raises further questions to consider in developing new policies and legislation dealing with water conservation.

CHAPTER 2: WATER PRICING

The value of water and water pricing are issues related to all aspects of water management. Albertans benefit from the existence and use of provincial water resources, but as taxpayers and consumers, they also pay the costs associated with managing and developing these resources. Any changes in water management objectives or practices will have economic consequences.

The provincial government has had a policy of not charging directly for volumes of water that are withdrawn and used except for hydroelectric power production. As a result of various subsidy programs, users have been given access to water at prices below the actual long-term costs of providing water service. These water pricing practices may no longer be appropriate as water and financial resources are becoming more scarce. An alternative approach to pricing would be based on the principle of "user pay" where consumers, not taxpayers, would have to pay for the amount of water they actually consume. Such a change may make individual Albertans more accountable for their consumption of water resources and could encourage wise use of water through conservation and increased efficiency.

The background paper assesses water pricing in four different contexts: generating revenues to cover administrative costs, cost-of-service pricing, conservation pricing, and the purchases of water rights. The paper explains each of these four approaches to water pricing in detail.

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WATER CONSERVATION

INTRODUCTION

Water is one of Alberta's most valuable renewable resources. Although 80 percent of the earth's surface is covered with water, only a very small amount is available for human consumption. As we use more and more water, or as pollution increasingly affects water quality, it becomes necessary to protect and conserve these water resources.

Alberta's water resources include surface water, groundwater, glacial ice, snow packs, lakes and wetlands. We depend on these water resources as a means of supporting and enhancing the quality of life. The importance of water to life and a healthy ecosystem emphasize the need to practice conservation of this precious resource.

This background paper provides information on water conservation and reasons for its consideration in formulating Alberta's water management policy and legislation. Alberta's water conservation experiences and an overview of methods for achieving water conservation are included as well.

WHAT IS WATER CONSERVATION ?

Water conservation means different things to different people. Water conservation needs to be defined in an Alberta context for inclusion into new water management policies and legislation. The concept may range from a very specific notion, such as using less water, to something very general, such as providing means to achieving sustainable water management and maintaining aquatic ecosystems. The following criteria or building blocks that may be included in a definition of water conservation are:

- practising wise use,
- using less water,
- maintaining water quality,
- protecting water supplies, and
- preserving water resources.

Practising Wise Use

Alberta Environment's mission statement affirms the Government's commitment to "achieve the protection, improvement and wise use of our environment, now and in the future." It is widely understood that mankind is part of the environment and that water is a key component of the environment, essential to life and our well-being. Wise use, as it relates to conservation of the province's water resources implies concern for the maintenance of water quality and quantity to sustain life, now and in the future.

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Using Less Water

Life cannot exist without using water. The water individuals use, however, reflects both their needs and their wants. Reducing our wants results in reducing the amount of water we use. The amount of water each individual uses is important because all of these individual uses add up. In Alberta, municipal per capita water use ranges between 200 and 800 litres a day. Alberta's agricultural sector is the highest consumptive user in the province. Industry uses substantial amounts of water for resource recovery and processing.

A municipality with a high per capita water use will need to construct large capacity water treatment systems. These expensive developments are paid for by a combination of property taxes and water bills. Reducing the amount of water use without sacrificing basic needs can provide economic benefits to water users. Using water more efficiently is often cheaper and environmentally preferable to developing new supplies.

Maintaining Water Quality

To some Albertans, water conservation means maintaining certain water quality characteristics, such as biological oxygen demand, dissolved solids, temperature and colour, and dilution of effluents that may be discharged into water ecosystems.

Water quality may be enhanced or maintained by reducing the volume of water removed from, or discharge into, surface water systems. Water that is consciously conserved in this manner results in improved water qualtiy.

Recycling the water used for resource recovery or industrial processing results in less waste water requiring treatment and disposal. Reduced volumes of waste water mean less pollution of both surface and groundwater resources.

Protecting Water Supplies

Protecting water resources from pollution and from over use or depletion are commonly-held reasons for water conservation. For example, municipalities are concerned about protecting their water supplies from pollution. Wildlife agencies are interested in protecting water habitat from the impacts of other uses. In agricultural areas, there is a substantial interest in protecting groundwater from concentrations of herbicide and pesticide chemicals. At *in situ* oil recovery projects, regulations are enforced to prevent waste water discharges into surface or groundwater sources.

Preserving Water Resources

Water has social, environmental and economic values. These values require careful consideration when making decisions to use water. For example, it may be important to preserve water for aesthetic, wildlife habitat and ecological reasons as well as industrial or agricultural uses. To some people, water conservation means preserving the quantity and quality of water resources by not allowing the resource to be used for consumptive purposes.

Alberta Government Policy On Water Conservation

The Alberta Government policy on water conservation is that the true value of water must be recognized to ensure that it is put to its most beneficial use and is not wasted.

WHY CONSERVE WATER ?

Water conservation, we are told, is the right thing to do. But people are often uncertain why it is the right thing to do and what water conservation means. Historically, Alberta Environment has acted in the public interest to manage the province's water resources in a manner that served the widest range of uses. This responsiblity will continue, and it can be complemented by encouraging users to be more careful in their usage of water.

The headwaters of some of North America's major river systems are located in Alberta. The degree to which Alberta conserves water resources within the province is also of importance to ecosystems, communities, and activities located in the provinces, territories and states downstream of Alberta. Alberta has both an ethical and legal responsibility to manage water resources within the province so that downstream activities are not impaired by poor quality or insufficient amounts of water.

Sustainable development means ensuring that the use of resources and the environment today does not impair prospects for their use by future generations. Water conservation is a means of providing future generations with an endowment of water resources and is therefore a tool for achieving sustainable development.

WATER CONSERVATION ACTIVITIES

The ***Water Resources Act*** does not include provisions for promoting or legislating water conservation. Alberta Environment has implemented some programs, however, that demonstrate or facilitate the protection and wise use of water resources. Examples of these initiatives are identified below.

Cold Lake-Beaver River Long Term Water Management Plan

The demand for using potable water for ***in situ*** oil recovery in this northeastern area of the province had the potential to adversely impact on the region's water resources, and it was for this reason that a planning program for the region's water resources was initiated. The affected public participated with industry and government to resolve this issue. A long-term water management plan created from this partnership process features conservation of lake water and groundwater. The plan stipulates that growth in industrial water demand will be met by diverting water by pipeline from the North Saskatchewan River to the Cold Lake-Beaver River Basin.

Recycling Guidelines for Enhanced Oil Recovery

Another outcome of the Cold Lake-Beaver River Long Term Water Management Plan was the development of water recycling guidelines for ***in situ*** oil recovery projects. Alberta Environment and the Energy Resources Conservation Board were responsive to public concerns and have implemented formal guidelines requiring industries to recycle water used for ***in situ*** oil recovery projects. Water recycling is required for projects using 500 cubic decametres (400 acre feet) of water annually, and pilot projects are required to implement water recycling demonstration projects. These guidelines reduce the demands on fresh groundwater, and also protect the groundwater resource from pollution caused by disposal of waste water into deep wells.

Irrigation Headworks Rehabilitation

Almost 90 percent of the water consumed in Alberta is used in the agricultural sector, primarily for irrigation. Alberta Environment assumed ownership of an extensive network of dams, headworks and canal systems from irrigation districts in Southern Alberta. This system required significant rehabilitation to improve its efficiency in conveying water to the Irrigation Districts. Alberta

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Environment, jointly with Alberta Agriculture, initiated a multi-million dollar rehabilitation program under the Alberta Heritage Savings Trust Fund in 1975. The program was expanded in 1980 to continue until 1995.

South Saskatchewan River Basin Management Policy

This basin includes the Red Deer, Bow, Oldman and the South Saskatchewan rivers, a region which has the highest demand for water in Alberta, but the smallest annual flow. Following completion of the South Saskatchewan basin planning program, the Alberta Water Resources Commission conducted an extensive public consultation program to develop a water management policy for this basin.

This new policy (1990) views water conservation and wise use as a basic part of its objectives for wise management of the South Saskatchewan Basin. Irrigation expansion guidelines with consideration for all other uses are established. An upper limit on irrigation expansion will encourage Irrigation Districts to use water more efficiently in order to further increase irrigation acreages.

Instream Flow Needs

The South Saskatchewan policy also defined the basis for conserving water for instream uses such as fisheries and recreation. Instream Flow Needs (IFN) attempt to define the minimum flow of water necessary to maintain healthy aquatic ecosystems in rivers and streams. Minimum flow needs both influence, and are influenced by, water qualtiy conditions and effluent discharges. Alberta's rivers have been ranked in importance for initiating IFN guidelines, and studies are continuing for several river reaches. IFN guidelines for long-term management will be established and will facilitate water conservation in these rivers. A longer discussion of this topic is found in Background Paper Volume #5.

WATER CONSERVATION OPTIONS AND OPPORTUNITIES

The protection and wise use of Alberta's water resources will require appropriate policies and legislative instruments. Water conservation may be achieved by a combination of water quality and demand management approaches.

Water Quality

Pollution of water resources occurs from point and non-point sources. Point source water pollution may be managed by implementing site-specific effluent control guidelines and regulations. Non-point source water pollution may be approached from watershed management practices and integrating land use practices with water management through river basin planning programs.

Demand Management

Demand management means, wherever practicable, reducing the need for more water by end users. Rather than constructing new water supply systems, demand management can achieve increased efficiencies in existing water supply systems in a non-structural and inexpensive manner. A variety of methods are available to improve the efficiency of our end uses of water. These include financial incentives, operational efficiencies and public education.

Financial Adjustments

Market forces are effective in shaping consumer behavior. Adjustments to the price of water would lead to changes in water demand. Financial adjustments include volume-based water and

effluent pricing, tax incentives for the implementation of water conservation technologies, and fines and penalties for wasteful use and water pollution.

Volume-based water and effluent pricing can provide a fair method for implementing a user pay system. Users would pay uniform rates, or equal rates, for the amount of water they use and for the amount of waste water they discharge. Variations on this pricing approach include seasonal rates, and increasing block rates where the more one uses the more is paid per unit.

Users who demonstrate water conservation by installing and using water conservation devices could be rewarded through tax incentives. Tax rebates on the purchase, installation and operation of such devices would encourage large water users to become more efficient with water consumption.

Fines and penalties are incentives to use water wisely. However, they usually address the problem after excessive use or pollution has occurred. Therefore, they may not be the most effective monetary technique to use in facilitating water conservation but would be more appropriate for enforcing regulations.

Operational Adjustments

Operational adjustments include metering water use, leak detection and repair programs, retrofitting water use fixtures, recycling water and using drought tolerant landscaping.

Metering is a key step in moving towards maximum effieciency in water allocation and in facilitating leak detection in water distribution systems. The amount of water produced at a treatment plant and the amount of water used by customers can be readily determined by meters. Water distribution systems would operate at higher efficiencies as leakage problems are identified and repaired.

Improved design standards for water fixtures makes them use less water. Many of these advances are the direct result of water shortages in urban areas in the United States. Retrofitting devices in existing homes and installing improved devices in new homes are economical investments to people paying utility bills.

Recycling water reduces the demand for fresh water. This technique is most suitable for industrial and manufacturing processes requiring water and may also be applicable to irrigation.

Outdoor water use in summer months places a strain on municipal water treatment plants because peak demand often exceeds production capacity. Landscaping to reduce demand for lawn water is a widely accepted approach in dry areas of California, Arizona, Texas and New Mexico. Such adaption here could prove successful as well.

Privatization of municipal water supply and distribution systems has proven to be an effective institutional technique in achieving greater operational efficiency in other jurisdictions. Transforming the delivery of a public utility, such as water, into a private business similar to electricity, telephone and natural gas utilities has the potential for service and cost efficiencies. It can also lead to the identification and payment of the real cost of providing each service.

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Education and Regulations

Education programs can inform water users about water conserving technologies, methods to reduce waste, and water efficient behavior. Public awareness campaigns include brochures and mail inserts with water bills targeted to household occupants. Newspaper, radio and television notices provide information about water conservation. Displays at trade fairs and special events provide opportunities for an exchange of information. A specially designed curriculum can help develop a conservation ethic in the school age population.

Regulations include provisions set out by municipalities in by-laws as well as provincial regulations for water. Municipal regulations can deal with building codes that provide for water meters, water-efficient fixtures and landscaping guidelines. Municipal regulations fix water and sewer rates and determine flat rate or volume-based charges for water and, in this manner, can play an important role in amounts of water used.

Provincial regulations can address water licence issues. These regulations set the amounts of water entitled to a licence, set water quality objectives, and establish fees and charges for water. Provincial regulations can also address fines and penalties for violation of water user obligations.

Regulations can require water licencees to prepare a water conservation contingency program as part of the agreement. Licence conditions could require the licence holder to provide regular reports, to monitor and evaluate water use, and to substantiate requests for changes in the amount of water allocated by the licence.

CONCLUSION AND QUESTIONS FOR DISCUSSION

Alberta Environment's mission is to achieve the protection, enhancement and wise use of the environment now and in the future. In context with developing broad provincial policy and legislation to encompass water conservation, the aspects of water quality and quantity are encompassed within the terms "protection" and "wise use". Alberta's water management policies and legislation must ensure water quality and availability for ecological and beneficial uses.

Water conservation means different things to different people. Provincial policy on water conservation will facilitate developing new water management legislation and programs. Some questions that Alberta Environment is addressing in this endeavor are:

- What is an appropriate definition of water conservation in the Alberta context?
- What should be included in Alberta's policy on water conservation?
- Does water conservation mean more than the protection and wise use of water?
- What are the reasons for promoting water conservation?
- What policy legislation and regulations that facilitate conservation can Alberta adopt?
- What are the range of alternatives that implement conservation?
- If industry is required to demonstrate water conservation by water recycling as a condition of its water licence, is this an idea that is applicable at the municipal level?

- What are the opportunities for recycling effluent water from urban sewage systems in irrigation projects?
- Can natural state water licences be issued to conserve water quality and quantity for aquatic ecosystems in a variety of water resources?

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WATER PRICING

INTRODUCTION

The value of water and water pricing are issues related to all aspects of water management. While all Albertans benefit from the existence and use of provincial water resources, as taxpayers and consumers they also pay some of the costs associated with managing and developing these resources. Consequently, any changes in management objectives or practices related to such things as Water Rights or Enforcement (see Volume #2), Intergovernmental Cooperation (Volume #4), Water Management Projects (Volume #8), and Flood Damage Reduction (Volume #10) will have economic consequences.

To many Albertans, water pricing is an important issue. The history of economic development in southern Alberta is tied to the provision of large quantities of inexpensive water through numerous water-management projects. These projects have been funded primarily by taxpayers. However, increasing demands for water resources are now approaching the limits of available supply in some parts of the province, and alternative approaches for addressing water needs are being considered. One approach is based on the concept of water pricing. The water management problems now being faced in Alberta are not unique to the province, and various other jurisdictions have developed, or are considering, water pricing as a management tool.

Water pricing can achieve a number of different management objectives. First, pricing for water services based on the principle of "user pay" would switch the costs of water management from taxpayers to actual water users. This would necessitate the use of water meters to measure actual water use, and would make individual users more accountable for their water-use decisions. Such pricing practices could also lead to water conservation and improved efficiency of use.

Second, water rental fees or higher licence fees could be implemented so that water users would compensate the resource owner (the people of Alberta) for any reduction in water quantity or quality that occurs. Such pricing recognizes that water has a value over and above the cost of providing water service. The fees collected from water rental or licence fees could be used to offset the increasing costs of water management.

Third, if transferable water rights are adopted as part of new legislation, water prices would result from the buying, selling, and trading of these rights.

The purpose of this paper is to examine the various forms of water pricing in order to consider which of these may be appropriate for Alberta in the coming decades. To help make this assessment, water-pricing practices must be considered from two different perspectives. First, it must be considered whether each form of water pricing would lead to a more efficient and effective use of water and other resources like public funds. Second, we must assess whether the impacts of water pricing would be fairly and equitably distributed among water users within the province. In dealing with water issues, the objectives of economic efficiency and fairness are not always compatible.

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BACKGROUND

The concept of water pricing has been explored by recent studies conducted by various levels of government. In 1985, the Inquiry on Federal Water Policy recommended adoption of water pricing based on the principle that water users should pay for the water they use, and the cost of providing it (i.e. "user pay"). The Inquiry concluded that this policy "is intended not only to raise revenues but also to provide incentives to conserve resources, to distribute costs more equitably, and to foster individual and corporate responsibility in the use of water resources." In the absence of explicit "user pay" policies and practices for water use in Alberta, taxpayers pay some of the costs of water services so that consumers of water do not directly see all the costs associated with water use.

In Alberta, water pricing has been studied in the context of four different objectives:

- generating revenues to cover the capital, operating and maintenance costs of public water works;
- providing an incentive for water conservation;
- creating a water rental fee or licence fee that recognizes the value of water and generates revenues to offset the costs of water management; and,
- the implementation of a market-based mechanism that would allow water rights to be bought, sold and traded among competing users.

Each objective involves a different type of pricing structure, each of which has different implications for water use efficiency and for the distribution of the benefits and costs among water users. Any of these approaches to pricing would have significant impacts on water users, and all of them will require resolving a number of important problems before implementation is possible.

COST-OF-SERVICE PRICING

Current Situation

One objective of water pricing is to generate revenues to cover capital, operating, and maintenance costs of public water works. The ***Water Resources Act*** does not address cost-of-service pricing since municipal governments or other suppliers of water are responsible for providing water and/or sewer services and collecting revenues from the beneficiaries of these services.

The only exception is where water infrastructure is provided by Alberta Environment. In these few instances, the ***Water Resources Act*** indicates that charges may be levied for "services or facilities provided through works or undertakings", and cost-sharing agreements (called Use of Works Agreements) can be negotiated with local authorities. Some examples include the McLennan Girouxville Canal (costs are determined on a per capita basis), the Sheerness/Deadfish pipeline (28 water users pay according to the amount of water used), and the Henry Kroeger Water Commission (annual energy costs are cost-shared). In total, about 150 such agreements are

administered by Alberta Environment and about 75 percent of these generate some form of revenues. In 1990/91, revenues generated by these agreements totalled about $243,000.

Use of Works Agreements have yet to be universally applied due to concerns about whether potential water users are able to pay these costs. There is also a question of equity of water rates between irrigators who draw their water from irrigation districts, and irrigators who rely on headworks owned and operated by Alberta Environment. In the absence of universally applied Use of Works Agreements, water infrastructure is, in many cases, being subsidized by Alberta taxpayers.

In providing water service, the provincial government assists municipal governments and other water services through cost-sharing arrangements. While municipalities are responsible for the operating, maintenance, and debt-servicing costs of their water works, capital costs are typically shared with the provincial government. Under the Alberta Municipal Water Supply and Sewage Treatment Assistance Program administered by Alberta Transportation and Utilities, projects are cost shared on a 75/25 provincial/municipal basis for the first 600 persons and on a 50/50 basis for populations from 601 to 100,000. Large centres such as Calgary and Edmonton are not eligible for subsidies under this program. The annual costs of these programs have been dropping since the early 1980s, but amounted to about $23 million in 1989 and $600 million in total since 1979.

Irrigation Districts are another example of cost sharing. The districts collect fees from water users to cover costs of building, operating, and maintaining the distribution system. However, 86 percent of the cost of rehabilitating irrigation district works is paid by the provincial taxpayer.

The evidence suggests that the practice of cost-of-service water pricing in Alberta varies within the province and does not always generate sufficient revenues to cover the cost of water services. Much of the older infrastructure is in need of repair, and existing maintenance funds are proving inadequate. In addition, much of the actual costs of water and sewerage services has been paid by taxpayers, not consumers. For both reasons, consumers have not actually been paying the full costs of water infrastructure. Furthermore, in the absence of metering, there is no comprehensive data on actual water use in Alberta. As a result water managers do not always have all the information required to make fully-informed decisions.

Future Opportunities

As the ultimate responsibility for cost-of-service pricing rests mainly with those municipal governments, other provincial agencies, and irrigation districts that provide water service, Alberta Environment currently has limited opportunities to influence utility pricing practices.

Where water supply and/or treatment infrastructure is provided by Alberta Environment, future action on cost-of-service pricing may involve a more widespread and consistent use of Use of Works Agreements. Rather than negotiate such charges on a case-by-case basis as is current practice, it may be more appropriate to have a systematic procedure for establishing these charges, including provisions for metering. However, in devising this procedure, the following questions will need to be addressed:

- How will the project costs be split between private and public beneficiaries?
- In addition to annual operating and maintenance costs, will capital costs be shared?
- Are tax levies against land holdings the most efficient and equitable way of collecting costs from private beneficiaries?

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- Should these agreements exist for an indefinite period of time? If not, who will be responsible for long-term maintenance costs?

- One of the difficulties in applying cost-of-service pricing is that not all beneficiaries of a water supply system are water users. In the case of storage reservoirs, for example, boaters, fishermen and others also benefit. Should the principle of user pay be applied for non-consumptive water uses and, if so, how would user fees be implemented?

Where water supply infrastructure is provided by municipalities, there are few opportunities for Alberta Environment to have a direct effect on utility pricing practices. However, one opportunity might be to offer inducements (subsidies, loans, or grants) that would encourage municipalities to implement water charges that adequately address the capital, operating, and maintenance costs of infrastructure. Another opportunity could be to add conditions regarding water pricing practices or metering to water licences.

A similar approach has recently been taken by Alberta Transportation and Utilities. In renewing the Municipal Water/Wastewater Assistance Program for 1991, communities that do not have consumption-based water rates or that have above average water consumption and no water meters will only be eligible for 90 percent of grants available under the program.

If new cost-sharing and cost-of-service pricing practices are to be developed, Alberta Environment would have to work cooperatively with those other government agencies (Alberta Transportation and Utilities, the Public Utilities Board, etc.) that are ultimately responsible for determining cost-sharing and utility-pricing practices. Consideration would also have to be given to the following issues:

- What provincial/municipal cost-sharing formula is appropriate for water projects? Are different formulas required for different types of water projects?

- What is an appropriate mechanism for having existing beneficiaries pay for eventual replacement of infrastructure?

- Should new water users be asked to pay the total incremental cost of expanding water system users or should these costs be spread over all users?

- Should the province develop a program to encourage installation of water meters, either to provide water use information necessary for effective water management, or as a basis for water pricing?

These questions are difficult to answer, but will have to be addressed in determining whether the potential advantages of having a user pay system would outweigh the disadvantages, including the added financial burden for project beneficiaries.

CONSERVATION PRICING

Current Situation

In developing cost-of-service water pricing, a variety of different types of rate structures can be adopted. Some rates encourage efficient use of water through conservation while other types of rate structures can actually encourage waste. The impact of rate structures on consumption depends on the nature of water use: past

research has shown that the quantity of water used for residential and commercial purposes usually changes more in response to increased water prices than does the amount of water used for irrigation or industrial purposes.

In Alberta, a recent study by Environment Canada found that 46 percent of residents of municipalities of greater than 1,000 people were served by utilities having rate structures that are considered inefficient or wasteful - see Figure 1. These people paid either a flat rate, which does not vary according to the amount of water consumed (such as in Calgary), or a declining rate, where the average cost of water actually declines as the amount used increases. The majority of Albertans (52 percent) were found to pay a constant rate for each unit of municipal water used while only 2 percent paid an increasing block rate. In both cases, water metering is used to measure water consumption and determine water costs. Increasing block rates do the most to promote conservation since the larger users of water pay proportionately more than do smaller users.

The current mix of rate structures has a number of important implications for water use. First, there is often no incentive to use water wisely since many people are not penalized for using large amounts. Second, small water users tend to pay a disproportionately higher share of the total costs of some water supply systems. Third, to accommodate peak demands, which may be larger than necessary because of the low cost of water, supply systems are often built larger than required and this can impose excessive costs on water users.

On the other hand, many existing rate structures do not require monitoring of water usage (through metering) or the associated billing systems. This reduces the cost of water service, which means lower costs to water consumers. Any change in current rate structures that require metering and montoring could result in higher water prices for consumers.

Future Opportunities

To encourage wise use of water resources, conservation pricing practices are an important tool. As noted above, certain types of rate structures can promote water conservation and yield adequate utility revenues at the same time. However, given that municipalities and other suppliers are responsible for setting water rates, Alberta Environment currently has limited opportunities to directly develop and implement conservation pricing.

The main opportunity for provincial support of conservation pricing appears to be the use of incentives and penalties in municipal and other cost-sharing programs. Other opportunities include education programs and the funding of demonstration programs in selected communities. Provincial initiatives to help municipalities and other water suppliers develop effective conservation pricing strategies could also be effective.

In developing conservation pricing strategies, the underlying rationale is to have water consumers directly pay the all the costs associated with using water so that they can make responsible decisions about water use. However, the effectiveness of pricing strategies for water conservation will depend on whether the gains of improved water use efficiency actually outweigh the increased costs of implementing, administering and monitoring conservation programs.

If conservation-oriented water pricing strategies are to be adopted, the following questions will need to be resolved:

- Should the province take a more active role in encouraging or requiring municipalities to adopt conservation pricing practices for water services?
- Should conservation programs, funding and incentives be applied equally in all parts of the province?

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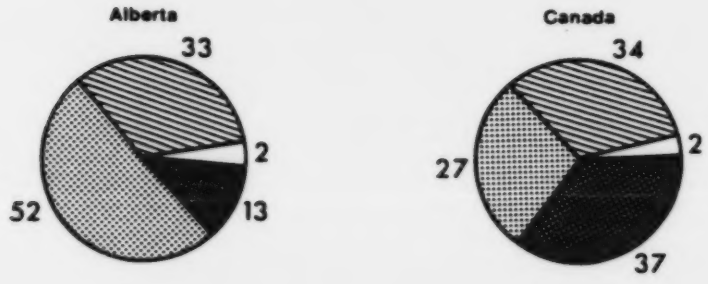
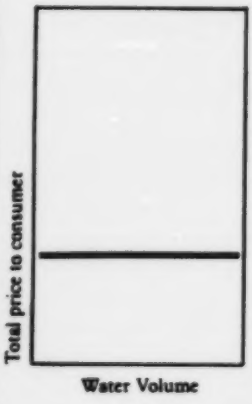
MUNICIPAL RATE STRUCTURES IN ALBERTA AND CANADA, 1986



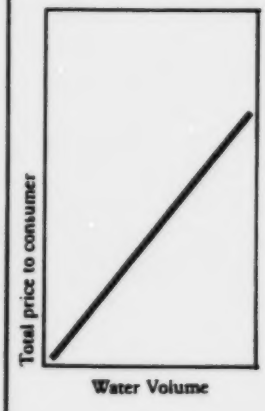
PERCENT OF POPULATION SERVED BY:

Flat Rate | Constant Unit Rate | Declining Block Rate | Increasing Block Rate



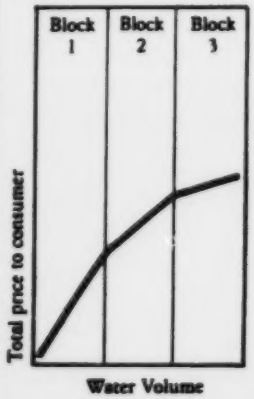
FLAT RATE

Flat rates, including those based on property assessment, are the predominant type of water rate used in Alberta. In each billing period, a fixed charge is levied regardless of the volume of water used. Within a municipality, this charge may vary according to certain "user classes". This type of rate is easy to administer and easily understood by the customer. However, the flat rate actually promotes excessive water demand, because the price of each additional unit of water consumed is zero. Customers have no incentive to curb water use, and the municipality has little control over demand, except through measures such as lawn-watering restrictions.



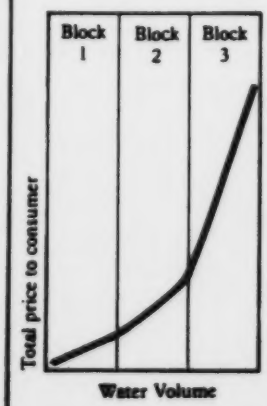
CONSTANT RATE

Another type of volume-based rate is the constant unit rate. Under this type of schedule, the consumer pays a fixed price for each unit (e.g. cubic metre) of water consumed. The bill to the consumer climbs uniformly with the volume used. Besides being somewhat more equitable than either the flat or declining block rate (because higher volume users pay for each additional unit of water consumed), a constant unit rate provides a significant incentive to conserve water.



DECLINING BLOCK RATE

The second most common of the volume-based water rates in Alberta is the declining block rate. Declining block rate schedules charge a successively lower price for set volumes of water as consumption increases through a series of "blocks". In other words, the bill to the consumer (total price) climbs much slower at the higher volumes of water used. Typically, the first or the first and second blocks cover residential and light commercial water use. Subsequent blocks cover heavier commercial and industrial uses. Declining block rates provide a decreasing incentive to conservation, because additional units of water decline in cost.



INCREASING BLOCK RATE

The increasing block rate works in essentially the same way as the declining block rate, except that the price of the water in successive blocks increases rather than declines. The consumer's bill rises faster with higher volumes of water used. The largest consumers of water, who are usually responsible for the on-going demand or the peak flows that dictate the size of municipal water systems, pay proportionately more. Increasing rates not only encourage conservation, they actually penalize higher consumption. Very few Alberta water rates follow this pattern.

Source: Environment Canada (1989). Municipal Water Rates in Canada, 1986.

Figure 1

If conservation pricing is introduced, careful attention will have to be given to development of an implementation strategy that identifies water uses and locations where conservation will achieve the greatest benefits.

WATER RENTALS/LICENCE FEES

Current Situation

The *Water Resources Act* allows the Province to levy water rental fees or royalties for any category of use. However, this provision for charging water royalties has only been applied to water withdrawn for hydroelectric power generation, and the resulting revenues are credited to the provincial treasury. Revenues from water used for hydroelectric power generation amounted to about $300,000 in 1989/90.

The current legislation and regulations also include provisions for water licence fees. However, such licence fees are levied once, at the time a water licence is issued. Based on the latest fee schedule, this amount is only about $1.50 per acre-foot for annual withdrawals in excess of 50 acre-feet. There are no similar fees for licensing effluent discharges. Similarly, there are no fees for water-storage projects or for any other non-consumptive water uses. Revenues from water licence fees amounted to only $13,000 in 1989/90.

Overall, the annual revenues generated through existing licence fees and water rentals do not cover the costs of administering water rights and discharge permits, let alone the associated costs of water testing, monitoring, and enforcement. The annual budget for the Water Resources Administration Division of Alberta Environment is about $2 million per year while total revenues from licence fees and royalties amount to only $313,000. Thus, administrative services are financed through provincial taxes rather than from water users.

Future Opportunities

Various approaches can be used demonstrate the social, economic and environmental importance of water and, at the same time, generate revenues. Experience from other jurisdictions indicates that a combination of one-time licence fees and annual fees is often used. British Columbia, for example, has a water-pricing system such that, in addition to a licence application fee, water users are also required to pay an annual water rental fee that reflects the volume of water being diverted. Different rental rates apply for different types of use, and these rates are chosen to reflect the ability of water users to pay for water as well as the extent of benefits arising from each particular use. Nova Scotia has a similar system with the exception that all consumptive users pay the same rate per unit of water.

If water rental or licence fees are implemented, very small annual charges per acre-foot of water could generate large revenues. For example, a charge of $1 per acre-foot of licensed withdrawals could raise at least $5 million per year. However, in setting these fees, it would be necessary to consider these questions:

- How much revenue should be generated through fees and licences?
- Should fees be collected annually or less frequently?
- Should the fee be a water rental, a licence fee, or some combination of the two?
- Should all types of users in all parts of the province pay the same fee per unit of water?
- Should rates reflect the amount of water withdrawn or the amount of water consumed?

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- Should the resulting revenues be ear-marked for specific water management initiatives?
- Should rental rates or licence fees be applied to users of groundwater as well as users of surface water?
- Should licenced non-consumptive or in-stream water users (like waste assimilation, water-based recreation, fisheries, etc.) be required to pay such a fee?
- What action should be taken if some water users are unable to pay such a fee?

PURCHASES OF WATER RIGHTS

Current Situation

Another way in which water pricing would occur is if the right to use water can be bought, sold, or exchanged among different users. At present, such transactions are not allowed for water rights per se under the ***Water Resources Act***.

In practice, however, water rights associated with specific land holdings are typically transferred to the landowners when these land holdings are bought and sold. These water rights can add significantly to the value of the land. For example, the difference in the purchase price of dryland and irrigated farms can be as much as $450 per acre, and a portion of this difference can be attributed to the water rights. Thus, landholders can currently capture an economic benefit from water rights through land sales.

Future Opportunities

One perceived weakness in the existing ***Water Resources Act*** is the inability to transfer water rights easily among water users. As explained in the background paper on Water Rights, this creates a problem when water resources are fully allocated and the nature of demand is changing, or when water shortages occur and there is no flexibility in sharing the available supply among all users. One of the possible solutions to this problem is the development of transferable water rights that can be bought, sold, or traded within some form of market.

If this solution is adopted, water rights could be transferred in whole or in part and on a permanent or temporary basis, among competing users. The transfer of water rights could result in a market-derived price for water that would likely vary from basin to basin, and perhaps within basins, to reflect local demand and supply conditions.

With the ability to sell or trade any water that is surplus to their actual needs, users holding water rights would have a financial incentive to make more efficient use of the resource. For example, allowing irrigators (including irrigation districts) with water rights to sell irrigation water (surplus or otherwise) would be a powerful incentive for them to become even more efficient users of water and could eventually create opportunities for further agricultural expansion in southern Alberta.

While unregulated markets might lead to more efficient water use from an economic perspective, the resulting distribution of water rights may not always be considered fair. Small users may not have the financial resources to purchase the water rights they might need and could be disadvantaged by the development of a water market. Consequently, some regulation of the market would be required to ensure that the broader social interests in water are adequately and fairly represented.

SUMMARY

In the past, the general policy of the Alberta Government has been not to charge directly for volumes of water that are withdrawn and used, with the exception of hydroelectric power production. And, through the use of various subsidy programs, water has also been made available to users at costs below the actual long-term costs of service, and many cost-of-service rate structures actually encourage wasteful use of water resources.

While existing water pricing practices were appropriate when the supply of water was relatively abundant compared to demand, and provincial finances were able to support extensive supply systems, this is no longer the case. In some parts of the province, there are concerns over the adequacy of supply and recognition that maximum withdrawals have nearly been reached (as evidenced by the recently-announced irrigation expansion guidelines). In addition, with the provincial deficit amounting to about $10 billion, subsidy programs supported by taxpayers for water services and infrastructure may no longer be affordable.

In the future, there are a multitude of ways in which water-pricing practices can be modified or introduced in support of better water management. The various methods can be adopted separately or in combination, but the choice of methods will be determined partially as a result of other changes in water management legislation and policies.

If any form of water pricing is adopted, Albertans will bear the cost of any such changes. These changes will occur directly in the form of higher water charges, and indirectly through higher prices for products and services that involve water use. To some extent, these costs are already being paid through income and other taxes, but increased water prices will increase consumer costs. This could create economic hardships for some types and classes of water users.

Having the value of water and the real costs of water service accurately reflected in water prices is consistent with the concept of "user pay". This approach to water pricing was recommended by the Inquiry on Federal Water Policy based on the assumption that user pay is considered more equitable than a tax-based system since not all water users are taxpayers. Such a change would make individual Albertans more accountable for their consumption of water resources and encourage wise use of water through conservation and increased efficiency.

However, compete adherence to the concept of user pay represents a departure from current practice which is based on the belief that not all groups are able to afford the cost of an assured supply of high quality water. For these groups, some form of cost-sharing is required, and the potential benefits of a province-wide user pay approach to water management would be insignificant compared to the fundamental human need for water. After the general public, the irrigation industry would be most affected by water pricing since, on a provincial basis, this industry accounts for about 45 percent of water allocations and 90 percent of total water consumption. For this stakeholder, implementation of water prices on existing operations, either through cost-of-service pricing or water rental/licence fees, would result in higher operating costs at a time when agricultural prices are falling or, at best, holding steady. As a result, farm incomes would be under even greater economic stress, and the resulting costs on the agricultural industry could quickly offset the potential gains of improved water use.

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